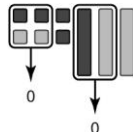


6. $-3x$, $3x$, and $7x$ are like $8x$; these terms have the same variable, x , raised to the same exponent, 1. Each term can be modelled with x -tiles.
7. $-n^2$, $2n^2$, and $5n^2$ are like $-2n^2$; these terms have the same variable, n , raised to the same exponent, 2. Each term can be modelled with x^2 -tiles.
8. I group like tiles and remove zero pairs. The remaining tiles represent:

a) $x + 4$



b) $-2 + x$



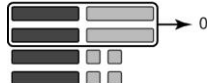
c) $2x^2 + x + 1$



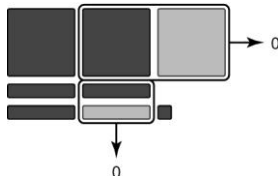
d) $5x^2 - 3x + 1$



e) $-2x + 4$



f) $-x^2 - 2x - 1$



9. Use a table.

Tile Model	Symbolic Record	Simplified Polynomial
a	$x^2 + x^2 + 1$	$2x^2 + 1$
b	$x^2 - 2x - 5 + x + 2 - x^2$	$-x - 3$
c	$-x^2 + 2$	$-x^2 + 2$
d	$x^2 - x^2 + 4x + 3 - x^2 - 2x - 3$	$-x^2 + 2x$
e	$2x^2 + 4 - 3x - 3 + 3x$	$2x^2 + 1$
f	$-x - 3$	$-x - 3$

Polynomials a and e are equivalent since both simplify to $2x^2 + 1$.

Polynomials b and f are equivalent since both simplify to $-x - 3$.

Polynomials c and d are equivalent since both simplify to $-x^2 + 2x$.

12. a) $2m + 4 - 3m - 8$ Group like terms.
 $= 2m - 3m + 4 - 8$ Add the coefficients of like terms.
 $= -m - 4$
- b) $4 - 5x + 6x - 2$ Group like terms.
 $= -5x + 6x + 4 - 2$ Add the coefficients of like terms.
 $= x + 2$
- c) $3g - 6 - 2g + 9$ Group like terms.
 $= 3g - 2g - 6 + 9$ Add the coefficients of like terms.
 $= g + 3$
- d) $-5 + 1 + h - 4h$ Add the coefficients of like terms.
 $= -4 - 3h$
- e) $-6n - 5n - 4 - 7$ Add the coefficients of like terms.
 $= -11n - 11$
- f) $3s - 4s - 5 - 6$ Add the coefficients of like terms.
 $= -s - 11$
13. a) $6 - 3x + x^2 + 9 - x$ Group like terms.
 $= x^2 - 3x - x + 6 + 9$ Add the coefficients of like terms.
 $= x^2 - 4x + 15$
- b) $5m - 2m^2 - m^2 + 5m$ Group like terms.
 $= -2m^2 - m^2 + 5m + 5m$ Add the coefficients of like terms.
 $= -3m^2 + 10m$
- c) $5x - x^2 + 3x + x^2 - 7$ Group like terms.
 $= -x^2 + x^2 + 5x + 3x - 7$ Add the coefficients of like terms.
 $= 8x - 7$
- d) $3p^2 - 2p + 4 + p^2 + 3$ Group like terms.
 $= 3p^2 + p^2 - 2p + 4 + 3$ Add the coefficients of like terms.
 $= 4p^2 - 2p + 7$
- e) $a^2 - 2a - 4 + 2a - a^2 + 4$ Group like terms.
 $= a^2 - a^2 - 2a + 2a - 4 + 4$ Add the coefficients of like terms.
 $= 0$
- f) $-6x^2 + 17x - 4 - 3x^2 + 8 - 12x$ Group like terms.
 $= -6x^2 - 3x^2 + 17x - 12x - 4 + 8$ Add the coefficients of like terms.
 $= -9x^2 + 5x + 4$
14. a) $3x^2 + 5y - 2x^2 - 1 - y$ Group like terms.
 $= 3x^2 - 2x^2 + 5y - y - 1$ Combine like terms.

$$= x^2 + 4y - 1$$

b) $pq - 1 - p^2 + 5p - 5pq - 2p$ Group like terms.
 $= -p^2 + 5p - 2p + pq - 5pq - 1$ Combine like terms.
 $= -p^2 + 3p - 4pq - 1$

c) $5x^2 + 3xy - 2y - x^2 - 7x + 4xy$ Group like terms.
 $= 5x^2 - x^2 + 3xy + 4xy - 2y - 7x$ Combine like terms.
 $= 4x^2 + 7xy - 2y - 7x$

d) $3r^2 - rs + 5s + r^2 - 2rs - 4s$ Group like terms.
 $= 3r^2 + r^2 - rs - 2rs + 5s - 4s$ Combine like terms.
 $= 4r^2 - 3rs + s$

e) $4gh + 7 - 2g^2 - 3gh - 11 + 6g$ Group like terms.
 $= -2g^2 + 6g + 4gh - 3gh + 7 - 11$ Combine like terms.
 $= -2g^2 + 6g + gh - 4$

f) $-5s + st - 4s^2 - 12st + 10s - 2s^2$ Group like terms.
 $= -4s^2 - 2s^2 - 5s + 10s + st - 12st$ Combine like terms.
 $= -6s^2 + 5s - 11st$

19. a) The dimensions of the rectangle are $5x$ and x . So, the perimeter of the rectangle is:
 $5x + x + 5x + x = 12x$

- b) The dimensions of the rectangle are $2x$ and 2 .
 So, the perimeter of the rectangle is: $2x + 2 + 2x + 2 = 4x + 4$

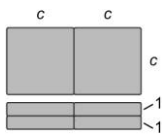
- c) The dimensions of the rectangle are $3x$ and $2x$.
 So, the perimeter of the rectangle is: $3x + 2x + 3x + 2x = 10x$

- d) The dimensions of the rectangle are $4x$ and 3 .
 So, the perimeter of the rectangle is: $4x + 3 + 4x + 3 = 8x + 6$

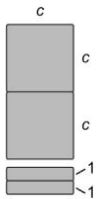
20. a) For perimeter $6c + 4$:



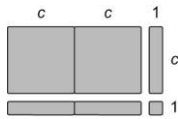
$$3c + 2 + 3c + 2 = 6c + 4$$



$$2c + (c + 2) + 2c + (c + 2) = 6c + 4$$



$$c + (2c + 2) + c + (2c + 2) = 6c + 4$$



$$(2c + 1) + (c + 1) + (2c + 1) + (c + 1) = 6c + 4$$



$$(3c + 1) + 1 + (3c + 1) + 1 = 6c + 4$$

I can make 5 rectangles with perimeter $6c + 4$.

b) For perimeter $4d$:



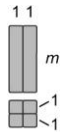
$$d + d + d + d = 4d$$

I can make 1 rectangle with perimeter $4d$.

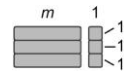
c) For perimeter $8 + 2m$:



$$m + 4 + m + 4 = 8 + 2m$$



$$2 + (m + 2) + 2 + (m + 2) = 8 + 2m$$



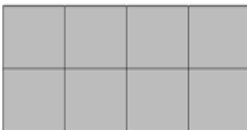
$$(m + 1) + 3 + (m + 1) + 3 = 8 + 2m$$



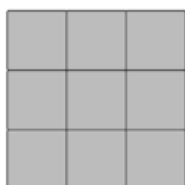
$$(m + 3) + 1 + (m + 3) + 1 = 8 + 2m$$

I can make 4 rectangles with perimeter $8 + 2m$.

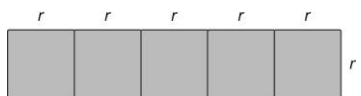
d) For perimeter $12r$:



$$4r + 2r + 4r + 2r = 12r$$



$$3r + 3r + 3r + 3r = 12r$$



$$5r + r + 5r + r = 12r$$

I can make 3 rectangles with perimeter $12r$.

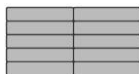
e) For perimeter $6s$:



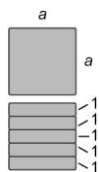
$$2s + s + 2s + s = 6s$$

I can make 1 rectangle with perimeter $6s$.

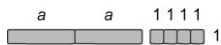
f) For perimeter $4a + 10$:



$$2a + 5 + 2a + 5 = 4a + 10$$



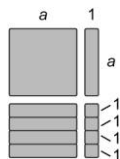
$$a + (a + 5) + a + (a + 5) = 4a + 10$$



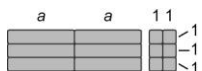
$$(2a + 4) + 1 + (2a + 4) + 1 = 4a + 10$$



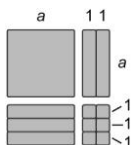
$$(2a + 3) + 2 + (2a + 3) + 2 = 4a + 10$$



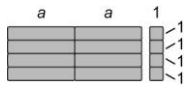
$$(a + 1) + (a + 4) + (a + 1) + (a + 4) = 4a + 10$$



$$(2a + 2) + 3 + (2a + 2) + 3 = 4a + 10$$



$$(a + 2) + (a + 3) + (a + 2) + (a + 3) = 4a + 10$$



$$(2a + 1) + 4 + (2a + 1) + 4 = 4a + 10$$

I can make 8 rectangles with perimeter $4a + 10$.

- 22.** The perimeter of the shape is the sum of the measures of all sides.

I calculate the side length that is not labelled:

$3x - x$, or $2x$.

Then, the perimeter is:

$$\begin{aligned} & x + y + 2x + 2y + 3x + 3y && \text{Group like terms.} \\ = & x + 2x + 3x + y + 2y + 3y && \text{Combine like terms.} \\ = & 6x + 6y \end{aligned}$$

The perimeter of the shape is $6x + 6y$.

